NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD AND SPECIFICATION

IRRIGATION SYSTEM, DRIP

(number and acre)
CODE 441

DEFINITION

A planned irrigation system in which all necessary facilities are installed for efficiently applying water directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe) operated under low pressure. The applicators can be placed on or below the surface of the ground.

PURPOSE

Efficiently apply irrigation water directly to the plant root zone to maintain soil moisture within the range for good plant growth and without excessive water loss, erosion, reduction in water quality, or salt accumulation.

CONDITIONS WHERE PRACTICE APPLIES

Drip irrigation plans shall be based on the evaluation of the site and the expected operating conditions. The soils and topography shall be suitable for irrigation of the proposed crops.

The water supply must be sufficient in quantity and quality for the crops to be grown. The drip method of irrigation is suited to most orchard crops and row crops, to steep slopes where other methods would cause excessive erosion, to areas where application devices interfere less with cultural operations, and to most climatic conditions where irrigated agriculture is feasible. This method is also suitable for irrigation of gardens, flowers, and shrubs in urban settings. Small flow rates of water can be used efficiently.

DESIGN CRITERIA

Depth of application. The net depth of application shall be sufficient to replace the water used by the crop during the peak use period or critical growth stage without depleting the soil moisture in the root zone of the crop below the minimum level established for optimum growth. The gross depth shall be determined by using field application efficiencies consistent with the conservation use of the water resources and shall include water required for leaching to maintain a steady state salt balance. The net depth of application per day shall be expressed as a volume per unit of area wetted.

$$Fn = 1.604 \frac{Q\ N\ T\ E}{AF}$$

Where:
Fn = net application depth, in inches per day
Q = discharge rate in gallons per hour per emitter
N = number of orifices or emitters
T = hours of operation per day
E = field application efficiency, expressed as a decimal
A = square feet of field area served by N (number of emitters)
F = percent of the total area to be wetted, expressed as a decimal
1.604 = units conversion constant (12 inches per foot per 7.48 gallons per cubic foot)

Field application efficiency assumed for design purposes shall not exceed 90 percent.

Capacity. The design capacity of drip irrigation systems shall be adequate to meet moisture demands during the peak use period of each and all crops to be irrigated in the design area. the capacity shall include an allowance for reasonable water losses during application periods. The system shall have the capacity to apply a stated amount of water to the design area in a specified net operating period. The design area may be less than 100 percent of the field area but not less than the surface area covered by the mature crop canopy. The design area for field crops shall be equal to 100 percent of the field area. The minimum design capacity shall be adequate to deliver the average daily water requirement of the crops during the peak use months in not more than 18 hours of operation per day. The remaining 6-hour period shall be considered

reserve capacity for use during daily periods when the water use rate exceeds the average daily use rate during the peak month.

Design application rate. The design rate of application shall be within a range established by the minimum practical discharge rate of the applicators (orifices, emitters, porous tubing, perforated pipe) and the maximum rate consistent with the intake rate of the soil. The application rate shall be expressed in gallons per hour per emitter or orifice, or per foot of porous tubing or perforated pipe.

The discharge rate of orifices, emitters, porous tubing, or perforated pipe may be determined from the manufacturer's data relating to discharge and operating pressure. Emitters shall be located to provide an overlap of the wetting pattern within the root zone.

Lateral lines. Lateral lines shall be so designed that when operating at the design pressure the discharge rate of any applicator served by the lateral will not exceed a variation of $\pm$10 percent of the design discharge rate.

Main lines. Main lines and submains shall be designed to supply water to all lateral lines at a flow rate and pressure not less than the minimum design requirements of each lateral line. Adequate pressure shall be provided to overcome friction losses in the pipelines and in all appurtenances, such as valves and filters. Main lines and submains shall be designed and installed according to the provisions of the Conservation Practice Standard (430) Irrigation Pipelines (430).

Filters. A filtration system shall be provided at the system inlet. If available, recommendations of the emitter manufacturer shall be used in selecting the filtration system. In the absence of the manufacturer's recommendations, the net opening diameter of the filter shall be not larger than one-fourth the diameter of the emitter opening.

All injectors, such as fertilizer injectors, shall be installed upstream of the system filter, except for systems having injectors equipped with separate filters.

The filter system shall be of such that flushing, cleaning, or replacement can be performed as required without introducing contaminants or foreign particles into the drip system.

PLANS AND SPECIFICATIONS

Plans and specifications for drip irrigation systems shall be in keeping with this standard and shall describe the requirements for properly installing the practice to achieve its intended purposes.

OPERATION AND MAINTENANCE

All irrigation systems must be adequately maintained to perform as planned and designed. Provisions for maintenance access must be provided.